[0006]

It is an object of the present invention to provide an actuator for a pickup which makes it possible to suppress a rise in rolling frequency and to prevent deterioration in damping characteristics even when a movable portion causes rolling with respect to a fixed portion, a pickup device, a recording medium drive device, and a method of producing an actuator for a pickup.

MEANS FOR SOLVING THE PROBLEMS

[0007]

The present invention provides an actuator for a pickup which includes: a fixed portion; a movable portion designed to be movable in each of a focusing direction extending along an optical axis of an objective lens and in a tracking direction substantially perpendicular to the focusing direction, due to a driving force transmitted from a drive portion, for holding the objective lens; and a plurality of linear elastic members of five or more each having ends connected to the movable portion and the fixed portion, respectively. The plurality of the linear elastic members is equal to one another in length dimension between the fixed portion and the movable portion. The ends of the plurality of the linear elastic members are located on a virtual circle formed on a plane by being projected onto a plane including both the focusing direction and the tracking direction. The virtual circle has a center defined as a rolling center, with which a center of translational forces of the linear elastic members coincides. ~~coincides with a~~At least one of a center of gravity of the movable portion, and a center of a driving force of the movable portion, ~~and a center of translational forces of the linear elastic members~~ coincides with the rolling center.

The present invention also provides an actuator for a pickup which includes: a fixed portion; a movable portion designed to be movable in each of a focusing direction extending along an optical axis of an objective lens and a tracking direction substantially perpendicular to the focusing direction, due to a driving force transmitted from a drive portion, for holding the objective lens; and a plurality of linear elastic members of five or more each having ends connected to the movable portion and the fixed portion,

respectively. The plurality of the linear elastic members is equal to one another in length dimension between the fixed portion and the movable portion. The ends of the plurality of the linear elastic members are located on a virtual circle formed on a plane by being projected onto a plane including both the focusing direction and the tracking direction. The virtual circle has a center defined as a rolling center, which coincides with a center of translational forces of the linear elastic members, a center of gravity of the movable portion, and a center of a driving force of the movable portion.

[0008]

The present invention also provides an actuator for a pickup which includes: a fixed portion; a movable portion designed to be movable in each of a focusing direction extending along an optical axis of an objective lens and in a tracking direction substantially perpendicular to the focusing direction, due to a driving force transmitted from a drive portion, for holding the objective lens; and four linear elastic members each having ends connected to the movable portion and the fixed portion, respectively. The ends of the four linear elastic members are located on a virtual circle formed on a plane by being projected onto a plane including both the focusing direction and the tracking direction; the ends are linked with each other by line segments constituting substantially a trapezoidal shape. The virtual circle has a center defined as a rolling center, which coincides with at least one of a center of gravity of the movable portion, a center of a driving force of the movable portion, and a center of translational forces of the linear elastic members.

[0009]

The present invention provides a pickup device which includes: the actuator for a pickup described above; and an actuator drive portion for driving the actuator for a pickup.

[0010]

The present invention provides a recording medium drive device which includes the pickup device described above.

[0011]

The present invention provides a method of producing an actuator for a pickup

including: a fixed portion; a movable portion designed to be movable in each of a focusing direction extending along an optical axis of an objective lens and in a tracking direction substantially perpendicular to the focusing direction, to hold the objective lens; and a plurality of linear elastic members of five or more each having ends connected to the movable portion and the fixed portion, respectively. The method includes: equalizing the plurality of the linear elastic members to one another in length dimension between the fixed portion and the movable portion; locating the ends of the plurality of the linear elastic members on a virtual circle formed on a plane by being projected onto a plane including both the focusing direction and the tracking direction, respectively; ~~and~~ making a center of translational forces of the linear elastic members coincide with a center of the virtual circle which is defined as a rolling center; and making at least one of a center of gravity of the movable portion and a center of a driving force of the movable portion coincide with the rolling center~~making at least one of a center of gravity of the movable portion, a center of a driving force of the movable portion, and a center of translational forces of the linear elastic members coincide with a center of the virtual circle defined as a rolling center~~.

The present invention also provides a method of producing an actuator for a pickup including: a fixed portion; a movable portion designed to be movable in each of a focusing direction extending along an optical axis of an objective lens and in a tracking direction substantially perpendicular to the focusing direction, to hold the objective lens; and four linear elastic members each having ends connected to the movable portion and the fixed portion, respectively. The method includes: locating the ends of the four linear elastic members on a virtual circle formed on a plane by being projected onto a plane including both the focusing direction and the tracking direction; ensuring that line segments linking the ends with each other assume substantially a trapezoidal shape; and making at least one of a center of gravity of the movable portion, a center of a driving force of the movable portion, and a center of translational forces of the linear elastic members coincide with a center of the virtual circle defined as a rolling center.

BRIEF DESCRIPTION OF DRAWINGS

[0012]

Fig. 1 is a perspective view showing an entire pickup device according to a first embodiment of the present invention;

Fig. 2 is a plan view showing the entire pickup device according to the first embodiment of the present invention;

Fig. 3A is a schematic diagram showing a mounting structure of suspensions according to the first embodiment of the present invention as viewed from a tracking direction;

Fig. 3B is a schematic diagram showing the mounting structure of the suspensions according to the first embodiment of the present invention as viewed from a focusing direction;

Fig. 4 is a schematic diagram showing the mounting structure of the suspensions according to the first embodiment of the present invention as viewed in a direction from a lens holder to a suspension base;

Fig. 5 is a perspective view showing an entire pickup device according to a second embodiment of the present invention;

Fig. 6 is a plan view showing the entire pickup device according to the second embodiment of the present invention;

Fig. 7A is a schematic diagram showing a mounting structure of suspensions according to the second embodiment of the present invention as viewed from a tracking direction;

Fig. 7B is a schematic diagram showing the mounting structure of the suspensions according to the second embodiment of the present invention as viewed from a focusing direction;

Fig. 8 is a schematic diagram showing the mounting structure of the suspensions according to the second embodiment of the present invention as viewed in a direction from a suspension base to a lens holder;

Fig. 9 is a schematic diagram for explaining an arrangement for setting a center Os of translational forces of the suspensions in the second embodiment of the present invention; and

Fig. 10 is a schematic diagram showing a modified example of the present invention, which corresponds to Figs. 3B and 7B.